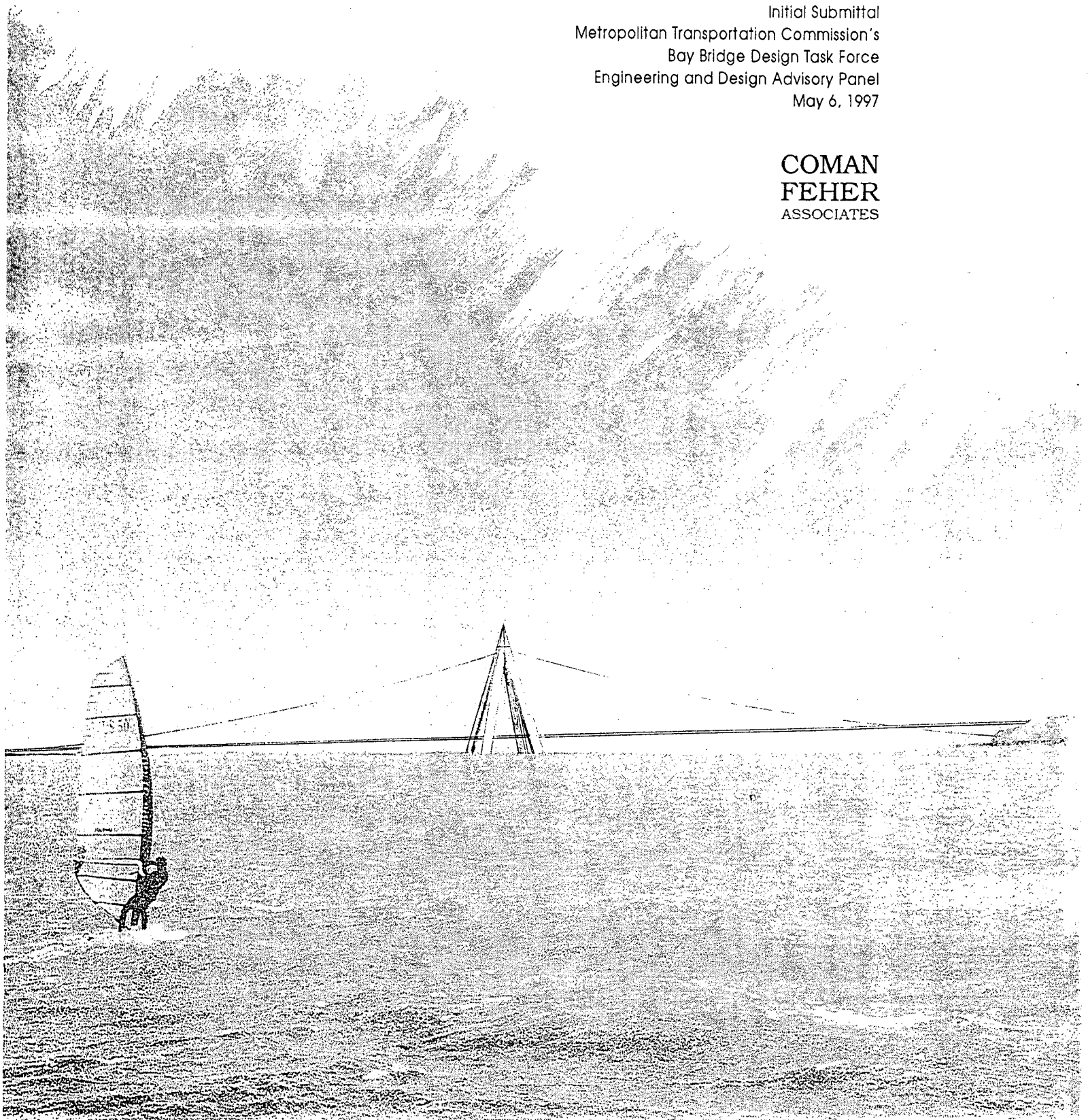


EAST SPAN REPLACEMENT OF THE SAN FRANCISCO-OAKLAND BAY BRIDGE

Initial Submittal
Metropolitan Transportation Commission's
Bay Bridge Design Task Force
Engineering and Design Advisory Panel
May 6, 1997

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GENERAL DESCRIPTION

This proposal describes a two-span suspension bridge situated along a straight alignment south of the existing SFOBB, with a central, mid-bay cable tower and anchorages at Oakland and Yerba Buena Island, respectively.

SPECIFIC CHARACTERISTICS, FUNCTIONS AND COMPONENTS

The central tower, which supports the main suspension cables, is the sole in-bay element.

The bridge deck consists of prefabricated box-beam segments.

The tower is a tetrapod with reinforced concrete legs founded in bedrock, which straddle the bridge deck and converge above it.

The apex of the tower above the main cables comprises an interior observation deck and several inhabitable floors accessible by elevators installed in the tubular legs of the tower.

A cable-stayed lower deck under the tower provides for bike, gondola, pedestrian and boat access to the tower elevators.

A bicycle path and cable gondola are suspended under the deck. The design of both bike path and gondola is suitable and intended for attachment under the existing western span of the SFOBB.

Wildlife refuge island around base of tower serves as bumper against marine collision.

STRUCTURAL CONSIDERATIONS

A central-tower suspension design was adopted in large part for seismic considerations. The anchoring of the tower and its geometry and mass below the waterline are considered to have a high tolerance to hydrodynamic forces such as observed in the fluidization of silt and clay at Bootlegger Cove, Alaska in 1964. Deflection characteristics as the legs ascend and the dynamic relationships of tower, cable, deck and anchorages are to work synergetically to achieve a high degree of damping and cancellation of resonance during seismic events.

The main structural elements of the central tower are four reinforced-concrete, slip-formed, tubular legs with equilateral-triangular cross sections. The legs form a square which is 172 meters on a side at sea level. At an elevation of 35 meters the deck passes between the legs, which rise to an elevation of 336 meters. From sea level the legs descend through water and silt, reaching bedrock, where each is anchored and founded. Injected-concrete piles descend from the legs near the base toward the interior of the tetrapod, widening each leg's effective bearing and providing support during construction.

STRUCTURAL CONSIDERATIONS (continued)

Deck in cross-section is an inverted airfoil affording superior aerodynamic stability. Each deck module is fabricated of extruded aluminum profiles as a honeycomb-core torsion box. Segments are joined one to the next by a system of welds, mechanical joinery and adhesives. Joinery employs thermoplastic carbon fiber composites.

Basic geometrics and engineering assumptions are based upon proven suspension designs, notably the Humber Bridge over the Humber River estuary in northeastern England.

Suspension cables are of sheathed liquid crystal polymer fibers. These are light-weight (specific gravity 1.4), with ultra-high tensile strength, close to zero thermal expansion, zero creep and are highly resistant to corrosive agents. Cable house in tower comprises a pulley system where the continuous shore-to-shore cables converge and bear upon the unified structure of the tetrapod. Main cables diverge toward shore to improve damping characteristics.

Alternatively, steel may substitute for aluminum and polymer fibers with minimal load adjustments and no change in design assumptions.

UNIQUE AND SUPERIOR FEATURES

Seismically proven isomorphic structure; seismic considerations guide the design throughout.

Prefabrication of major elements, slip-form tower, fewer in-bay sites and lightweight cables and deck facilitate rapid erection, reduce labor costs and reduce overall costs.

Observation deck and visitor attractions provide substantial revenue for payback of bridge.

Bike path is absolutely separated from automobile traffic and is free from exhaust and flying matter from automobiles, and the noise of traffic. A unique, safe, serene ride is possible between Oakland and San Francisco with spectacular views.

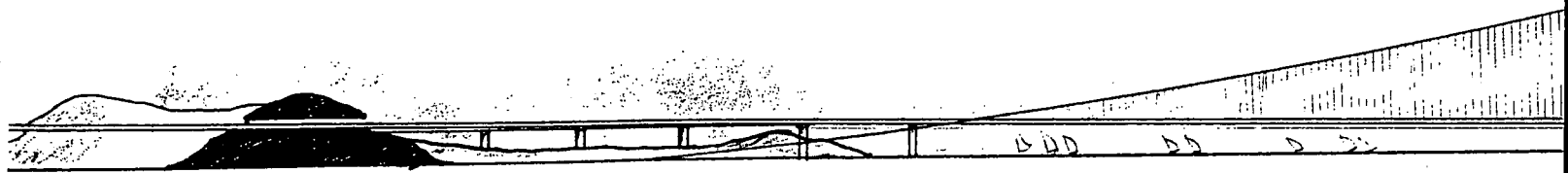
Cable gondolas provide revenue and clean public transportation.

Gondolas and bike path have routing to San Francisco and Oakland as well as to Yerba Buena and Treasure islands and to the tower. This enhances development plans for Treasure Island.

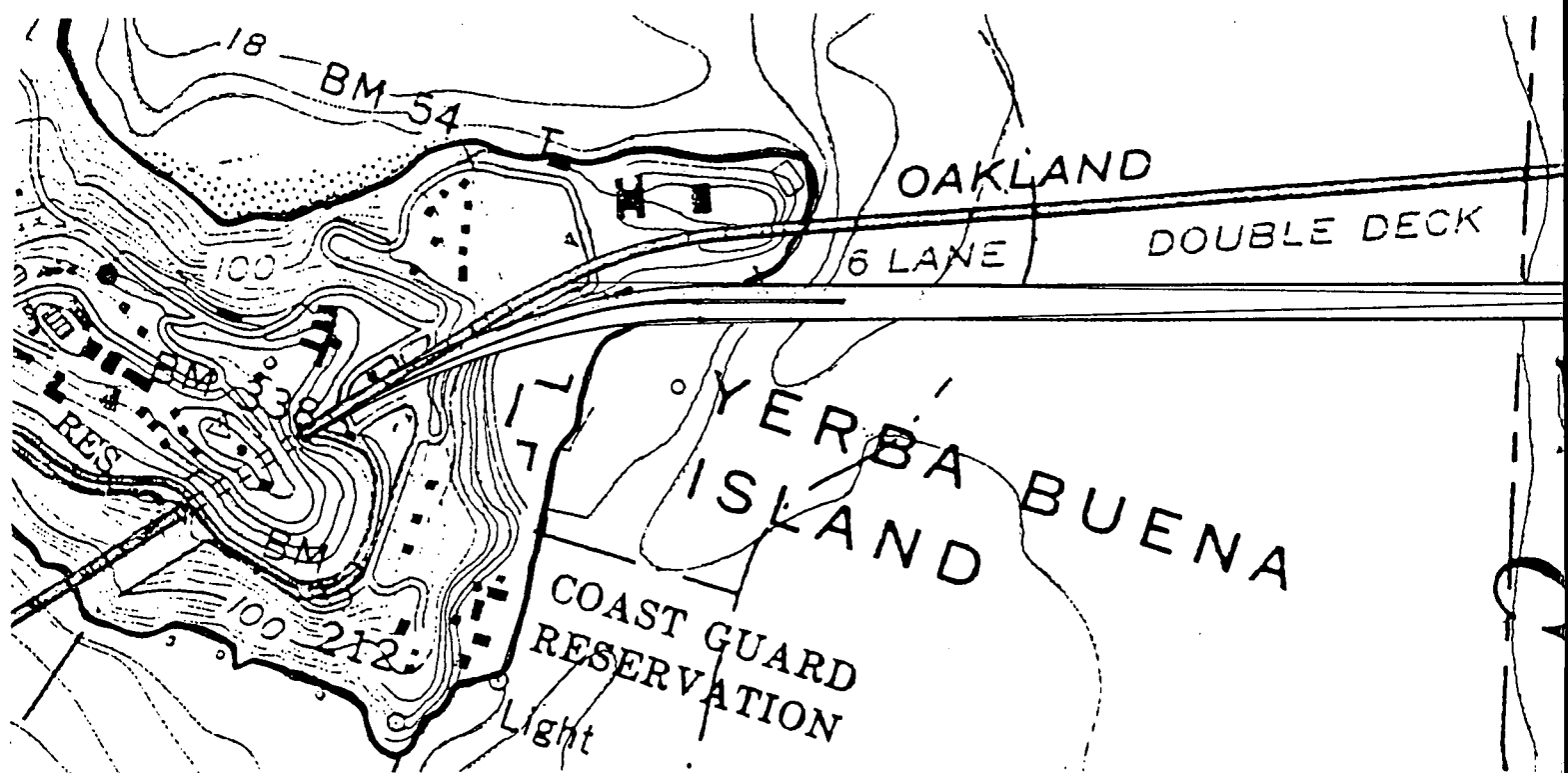
Fewer intrusions into the bay; bridge does not have multiple pylons and therefore does not appear, fence-like, to cut the bay in half. Single, central excavation causes less disruption to sensitive fish, pinnipeds and waterfowl.

Excavation into contaminated silt is reduced by having only four central excavations instead of nineteen. This in itself reduces the disposal problem to only one-eighth of other proposals. Additionally, since restored shore-line habitat (island) will surround the tower, the topmost silt (the most contaminated) can be disposed of by leaving it at the site, six meters below the new island.

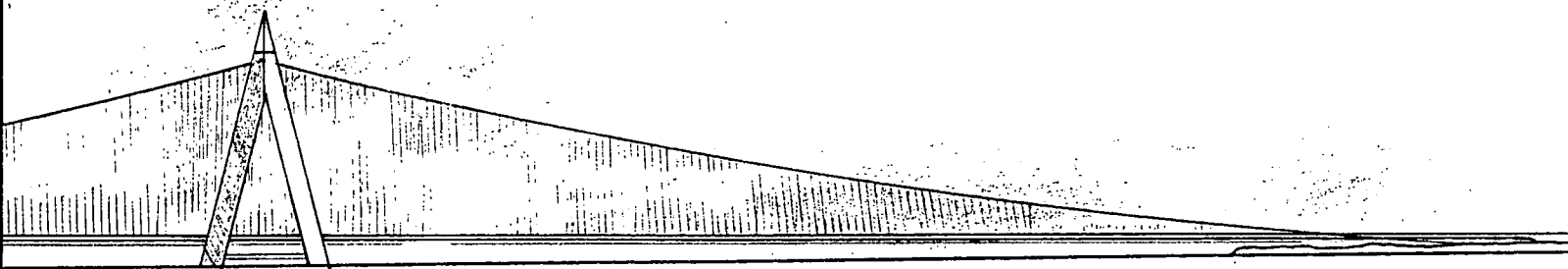
Gondolas, bike path and tower will enhance tourism on both sides of the bay, and will re-orient development, particularly on the Oakland side.



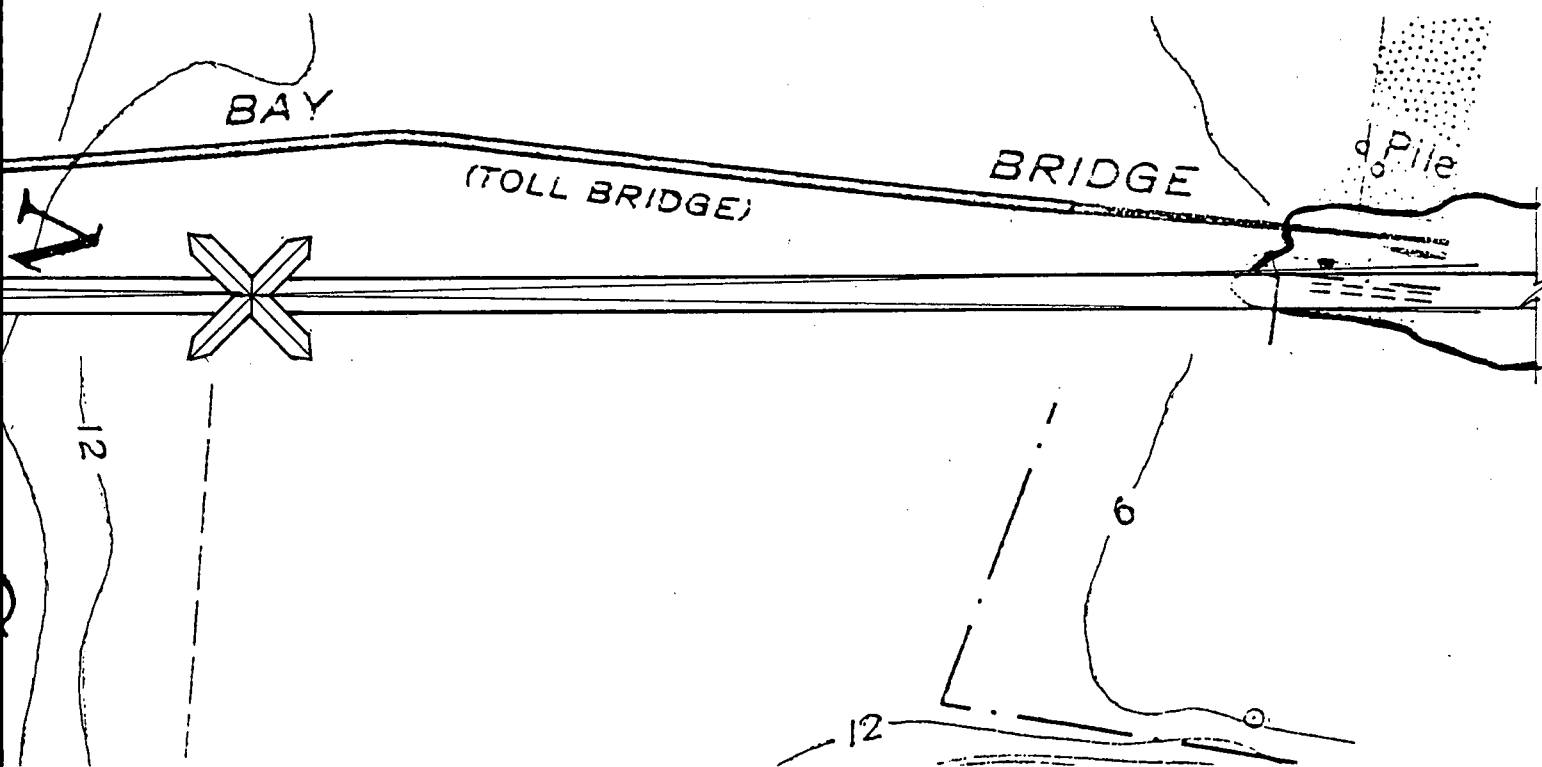
SOUTH ELEV



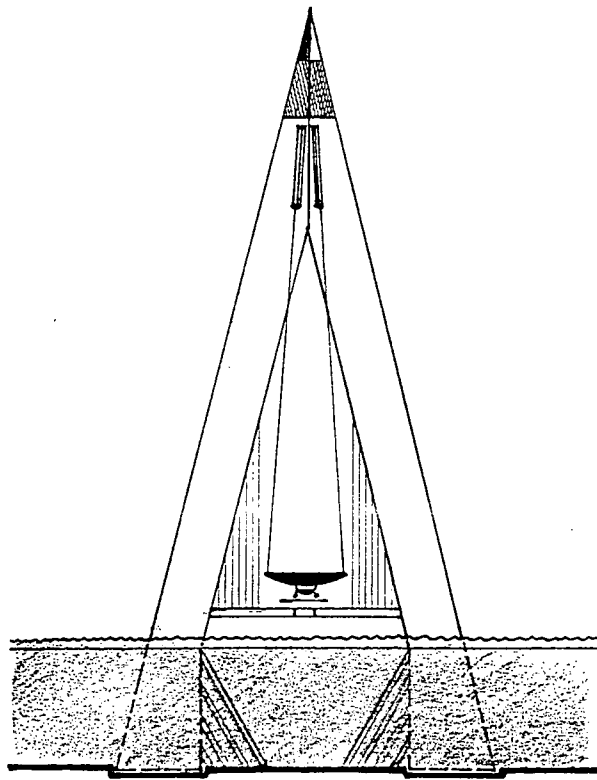
SITE PLAN



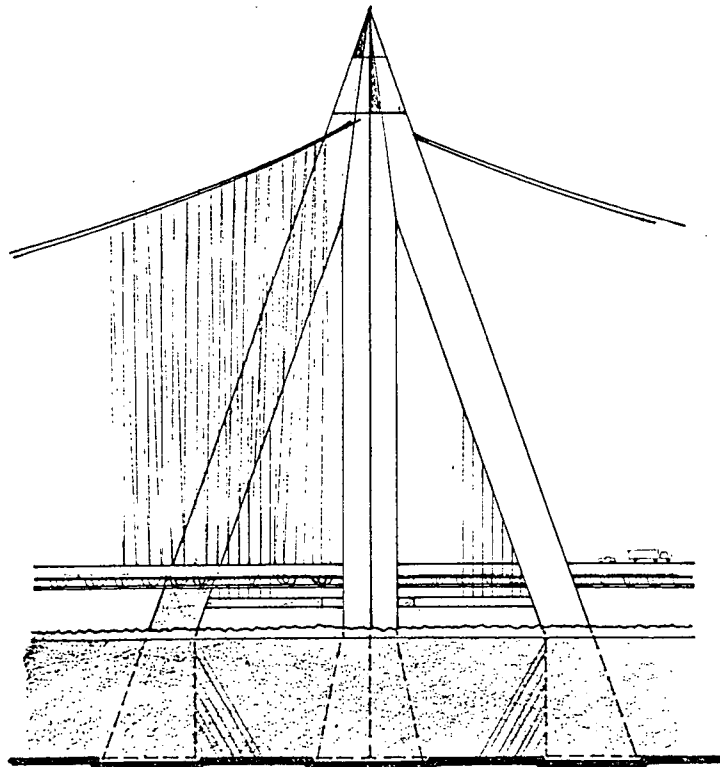
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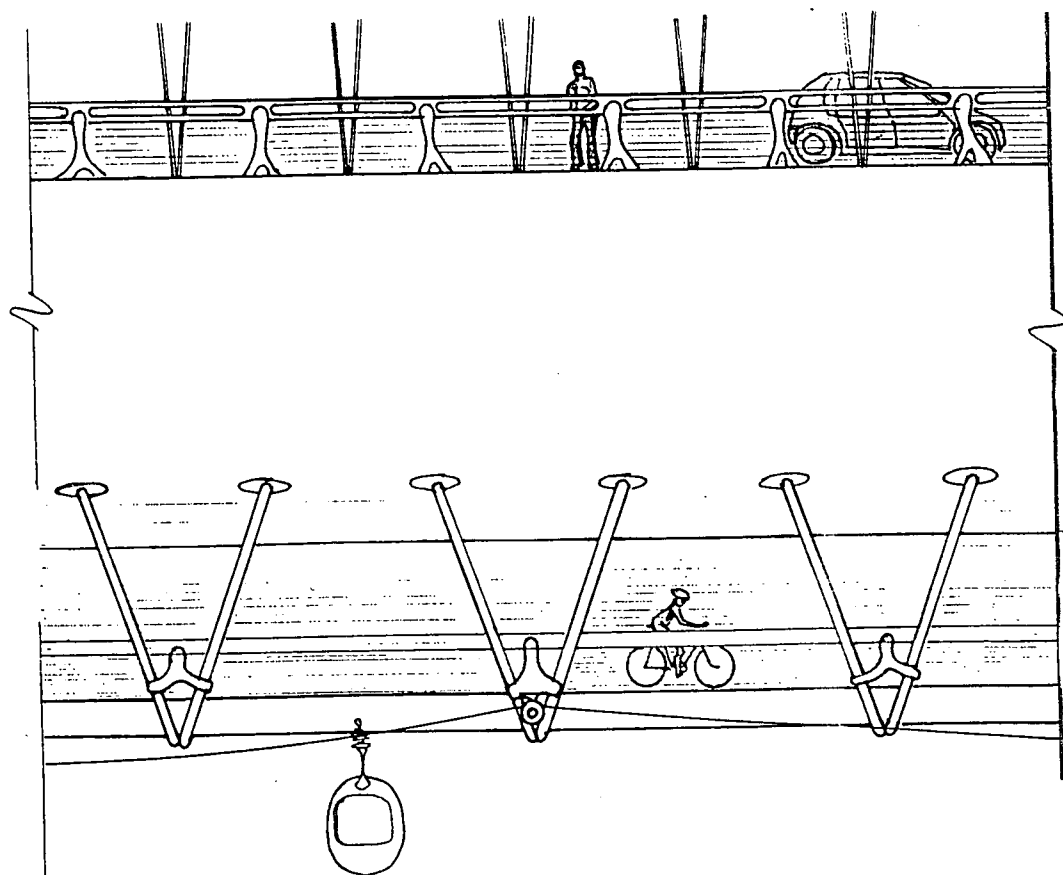
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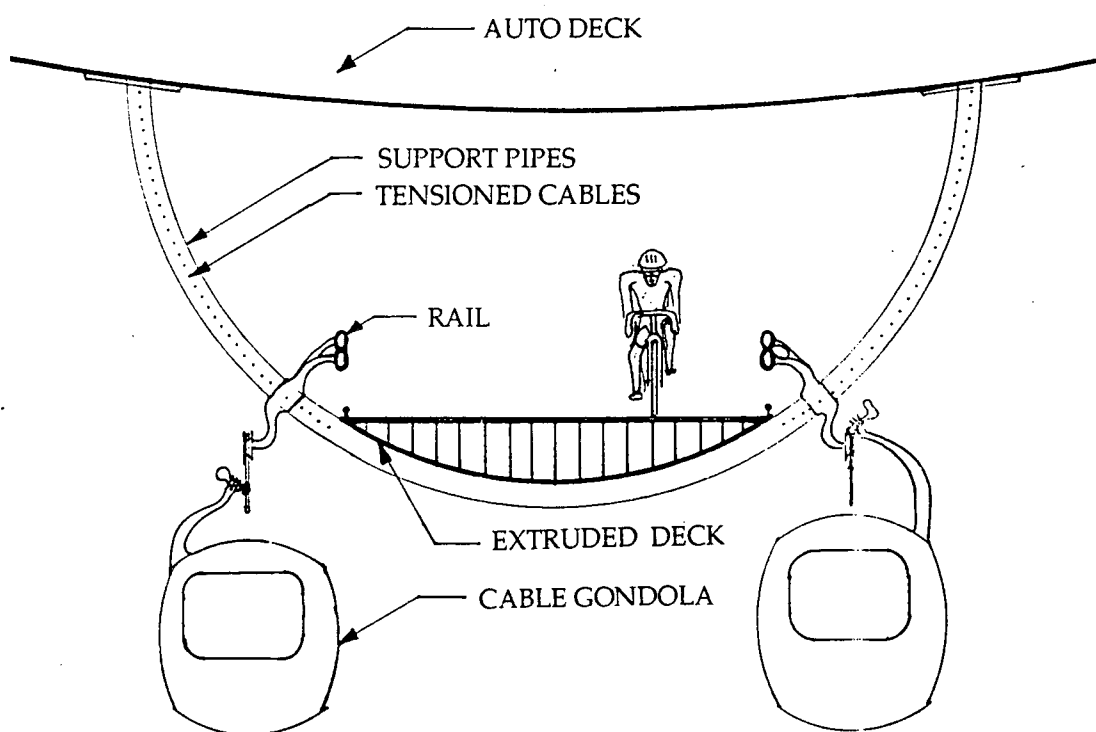
EAST/WEST ELEVATION
DECK CROSS SECTION



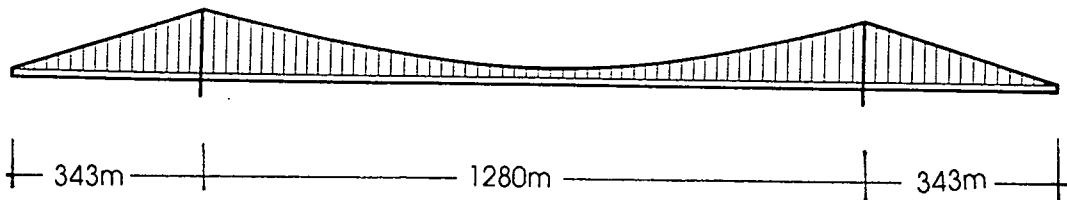
SOUTHWEST/NORTHEAST
ELEVATION



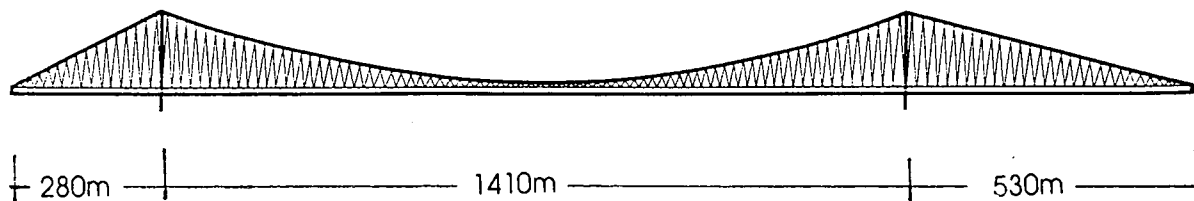
BRIDGE DECK PARTIAL ELEVATION



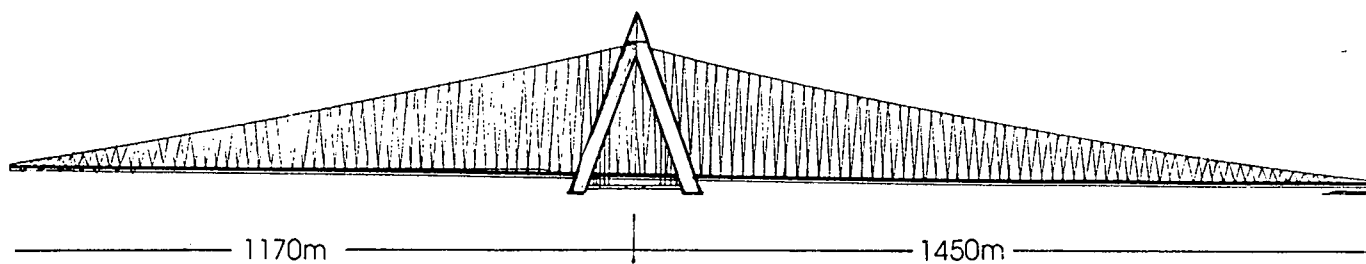
BICYCLE PATH CROSS SECTION



GOLDEN GATE BRIDGE



HUMBER BRIDGE



SAN FRANCISCO-OAKLAND BAY BRIDGE

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